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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/538,961	06/14/2005	Piotr Mirowski	57.0547 US PCT	7508

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SCHLUMBERGER-DOLL RESEARCH
ATTN: INTELLECTUAL PROPERTY LAW DEPARTMENT
P.O. BOX 425045
CAMBRIDGE, MA 02142

EXAMINER	
KENNEDY, ADRIAN L	

ART UNIT	PAPER NUMBER
2121	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/538,961	MIROWSKI, PIOTR	
	Examiner	Art Unit	
	Adrian L. Kennedy	2121	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Examiner's Detailed Office Action

1. This Office Action is responsive to Request For Continued Examination in application 10/538,961 filed **July 5, 2007**.

2. **Claims 1, 3, 8, 10** were amended.

3. **Claims 1-14** will be examined.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over West et al. (USPN 6,438,493) in view of Doyle et al. (USPN 5,504,479).

Regarding claims 1:

West et al. teaches,

(currently amended): A system for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from data (C 1, L 10-12; "*seismic data*") comprising

a neural network (C 3, L 13-14; "*probabilistic neural network*") for inferring class probabilities (C 7, L 51-54; "*extract classification probabilities*"), characterized

in that said system further comprises means for integrating class sequencing knowledge (C 6, L 58-61; "*a probabilistic neural network is constructed from the initial textural attributes, along with their associated initial facies classifications*"; The examiner takes the position that the "integration of class sequencing knowledge" as claimed by the applicant, would have been obvious over West et al. teaching the use of a probabilistic neural network in his invention. This position is based on the applicant's teaching of the integration of "knowledge of class sequencing and of class probability distribution in the neural network predictor" in Paragraph 0040, which is obvious in light of West et al.'s teachings.) and

optimising said class probabilities according to said sequencing knowledge (C 6, L 62-65; "*learning from, a set of training pattern*"; The examiner asserts that the "optimising" of the probabilistic neural network taught in the invention of West et al., is inherent in the training of the network.), and

storage (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the facies, it is inherent that there is some form of storage in the invention of West et al.) for said inferred geological classes (C 7, L 58-60; "*facies classifications*") to establish a relationship between the inferred geological classes and the data (C 7, L 60-62; "*classify the entire volume of seismic data*").

The examiner takes the position that while it would have been obvious to one skilled in the art to say that the seismic data used in the invention of West et al., is

from "downhole logs". However, the examiner has found that Doyle et al. better teaches the use of "downhole log data" as claimed and disclosed by the applicant.

Doyle et al. teaches,

> The data comprising downhole log data (C 1, L 12-14; "*well logging tools are used to make measurements of certain properties of earth formations penetrated by wellbores*"). It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of measuring seismic data (i.e. certain properties of earth formations) from a downhole log.

Regarding claims 2:

West et al. teaches,

> (original): The system wherein the means for integrating class sequencing knowledge and optimising said class probabilities according to said sequencing knowledge comprises a hidden Markov model.
>
> The examiner takes the position that the use of a hidden Markov model is inherent in the invention of the West et al. This fact is evident in the fact that the in probabilistic pattern classification process (C 7, L 23-25; "*pattern classification*"), West et al. makes use of a Markov process (C 4, L 62-65; "*Markov Chain Analysis*") where the hidden states in the model are the lithofacies (C 7, L 25-28; "*unknown points*"), the observed state in the model is the input seismic data (C 7, L 25-28; "*known points*"), and the goal is to determine the lithofacies that most likely to generated the seismic data (C 7, L 25-28; "*classification and prediction of unknown points*").

Regarding claims 3:

West et al. teaches,

(currently amended): An automated system for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from data (C 1, L 10-12; "*seismic data*"), comprising .

a data input vector (C 7, L 7-10; "*input vector*"),

a neural network (C 3, L 13-14; "*probabilistic neural network*") trained to infer from said input vector a class sequence or class probability vector, and a modifier for correcting said class sequence or class probability vector using prior knowledge of class sequence or class probability (C 7, L 51-54; "*extract classification probabilities*"; C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable outcome*"), and storage (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the facies, it is inherent that there is some form of storage in the invention of West et al.) for said inferred geological classes (C 7, L 58-60; "*facies classifications*") to establish a relationship between the inferred geological classes and the data (C 7, L 60-62; "*classify the entire volume of seismic data*").

The examiner takes the position that while it would have been obvious to one skilled in the art to say that the seismic data used in the invention of West et al., is from "downhole

logs". However, the examiner has found that Doyle et al. better teaches the use of "downhole log data" as claimed and disclosed by the applicant.

Doyle et al. teaches,

The data comprising downhole log data (C 1, L 12-14; "*well logging tools are used to make measurements of certain properties of earth formations penetrated by wellbores*"). It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of measuring seismic data (i.e. certain properties of earth formations) from a downhole log.

Regarding claims 4:

West et al. teaches,

(original): An automated system wherein the modifier (The examiner takes the position the modifier is the neural network) uses the prior knowledge of class probability distribution and class transition probability (C 6, L 58-61; "*initial textural attributes*"; The examiner takes the position that by teaching that textural attributes inherently contain statistical information (C 5, L 41-43; "*statistical measures, called textural attributes*") related to seismic data, West et al. anticipates the use of class probability distribution. Additionally, by teaching that seismic data include stratigraphic information, West et al. anticipated the use of class transition probability information.).

Regarding claim 5:

Doyle et al. teaches,

(original): An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

Regarding claims 6:

West et al. teaches,

(original): An automated system wherein the modifier includes a Bayesian based probability calculator (C 7, L 22-23; "*probabilistic neural networks are parallel implementations of a standard Bayesian classifier*").

Regarding claim 7:

Doyle et al. teaches

(original): An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

Regarding claims 8:

West et al. teaches,

(currently amended): A method for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from data (C 1, L 10-12; "*seismic data*"), comprising the following steps:

inferring class probabilities (C 7, L 51-54; "*extract classification probabilities*") with a neural network (C 3, L 13-14; "*probabilistic neural network*");

integrating class sequencing knowledge and optimising said class probabilities according to said sequencing knowledge (C 6, L 58-61; "*a probabilistic neural network is constructed from the initial textural attributes, along with their associated initial facies classifications*"; The examiner takes the position that the "integration of class sequencing knowledge" as claimed by the applicant, would have been obvious over West et al. teaching the use of a probabilistic neural network in his invention. This position is based on the applicant's teaching of the integration of "knowledge of class sequencing and of class probability distribution in the neural network predictor" in Paragraph 0040, which is obvious in light of West et al.'s teachings.); and

storing (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the facies, it is inherent that there is some form of storage in the invention of West et al.) said inferred geological classes to establish a relationship between the inferred geological classes (C 7, L 58-60; "*facies classifications*") and the data (C 7, L 60-62; "*classify the entire volume of seismic data*").

The examiner takes the position that while it would have been obvious to one skilled in the art to say that the seismic data used in the invention of West et al., is from "downhole logs". However, the examiner has found that Doyle et al. better teaches the use of "downhole log data" as claimed and disclosed by the applicant.

Doyle et al. teaches,

> The data comprising downhole log data (C 1, L 12-14; "*well logging tools are used to make measurements of certain properties of earth formations penetrated by wellbores*"). It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of measuring seismic data (i.e. certain properties of earth formations) from a downhole log.

Regarding claims 9:

West et al. teaches,

> (original): The method wherein the integrating class sequencing knowledge and optimising said class probabilities according to said sequencing knowledge is achieved according to a hidden Markov model.
>
> The examiner takes the position that the use of a hidden Markov model is inherent in the invention of the West et al. This fact is evident in the fact that the in probabilistic pattern classification process (C 7, L 23-25; "*pattern classification*"), West et al. makes use of a Markov process (C 4, L 62-65; "*Markov Chain Analysis*") where the hidden states in the model are the lithofacies (C 7, L 25-28; "*unknown points*"), the observed state in the model is the input seismic data (C 7, L 25-28; "*known points*"), and the goal is to determine the lithofacies that most likely to generated the seismic data (C 7, L 25-28; "*classification and prediction of unknown points*").

Regarding claims 10:

West et al. teaches,

(currently amended): A method for inferring geological classes (C 1, L 10-12; "*characterizing and mapping seismic facies*") from data (C 1, L 10-12; "*seismic data*"), comprising the steps of

generating a data input (C 4, L 16-19; "*textural attributes*") based on said well input data (C 3, L 61-63; "*seismic data*");

using a neural network (C 3, L 13-14; "*probabilistic neural network*") to generate a class sequence (C 7, L 23-25; "*pattern classification*") or class probability vector inferred from said input;

correcting said class sequence or class probability vector using prior knowledge of class sequence or class probability (C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable outcome*"); and

storing (C 9, L 43-44; "*the facies and probability volumes are stored at any give time*"; The examiner takes the position that by teaching the storing of the facies, it is inherent that there is some form of storage in the invention of West et al.) said inferred geological classes to establish a relationship between the inferred geological classes (C 7, L 58-60; "*facies classifications*") and the downhole log data (C 7, L 60-62; "*classify the entire volume of seismic data*").

The examiner takes the position that while it would have been obvious to one skilled in the art to say that the seismic data used in the invention of West et al., is from "downhole

logs". However, the examiner has found that Doyle et al. better teaches the use of "downhole log data" as claimed and disclosed by the applicant.

Doyle et al. teaches,

The data comprising downhole log data (C 1, L 12-14; "*well logging tools are used to make measurements of certain properties of earth formations penetrated by wellbores*"). It would have been obvious to one skilled in the art at the time of invention to combine the invention of West et al. with the invention of Doyle et al. for the purpose of measuring seismic data (i.e. certain properties of earth formations) from a downhole log.

Regarding claims 11:

West et al. teaches,

(original): The method wherein prior knowledge of class probability distribution and class transition probability is used to correct the class sequence or class probability vector (C 7, L 10-13; "*through training, the weights of the network are modified such that on a specific set of training examples, modification of the input attribute vectors produce a desirable outcome*").

Regarding claim 12:

Doyle et al. teaches

(original): An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

Regarding claims 13:

West et al. teaches,

> (original): The method wherein the correction includes a Bayesian based probability calculation (C 7, L 22-23; "*probabilistic neural networks are parallel implementations of a standard Bayesian classifier*").

Regarding claims 14:

Doyle et al. teaches

> (original): An automated system wherein the modifier includes a Viterbi sequence (C 13, L 62-64; "*Viterbi algorithm*"; The examiner takes the position that a Viterbi sequence is a sequence that has been generated with the use of the Viterbi algorithm).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. West et al. (USPN 6,560,540) is cited for his method for mapping seismic attributes using neural networks. Hoskins et al. (USPN 5,444,619) is cited for his system and method of predicting reservoir properties. Kim (USPN 6,442,487) is cited for his reliability measures for statistical and geological parameters in geophysical prospecting. Nivlet et al. (USPN 6,847,895) is cited for his method for facilitating recognition of objects, notably geologic objects, by means of a discriminant analysis technique.

Response to Arguments

Applicant's arguments filed on July 5, 2007 have been fully considered but are found to be non-persuasive. The unpersuasive argument made by the Applicant are stated below:

In reference to Applicant's argument:

> Regarding claim1, West et al. does not teach or suggest "a system for inferring geological classes". Reference is made to the arguments presented in the previous response. Further, the examiner's assertion that the "seismic facies" of West are equivalent to the "geological classes" is not supported by any evidence. In fact this interpretation is in contradiction to the specification of West.

Examiner's response:

The examiner has considered the applicant's above argument and asserts that the applicant's claimed and disclosed "geological classes" is substantially broad enough to include and/or be the "seismic facies" taught in the invention of West. This position is supported by West et al teaching in Column 1, Lines 19-22 that "*a seismic facies is a stratigraphic unit or region*". This position is further supported by the applicant stating in his previous arguments (Dated 1/18/07; Page 6, Paragraph 5) that "*the term "geological classes" is hence to be interpreted as a classification according to "geological features'*"" and the applicant broadly teaching that "*"geological classes" or "CLASSES" refers to, principally, the rock facies (lithofacies) or the reservoir rock types. However, any other discrete classification of geological features [...] is possible*". Furthermore, based on the above arguments, the examiner has found the applicant's argument to be non-persuasive.

In reference to Applicant's argument:

> It has now been further clarified by replacing the term "oilfield well input data" by "downhole log data" to remove any ambiguity about the distinction between the data used in the present invention as compared to the seismic data used by West.

Examiner's response:

The examiner has considered the applicant's above argument and takes the position that it in teaching the characterizing and mapping of seismic facies using seismic data it is inherent that the seismic data is from either below or above ground. Furthermore, in teaching that his seismic facies can be used to identify reservoir regions in Column 1, Lines 29-39, it is inherent in the invention of West et al. that "reservoir regions" would include downhole

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Adrian L. Kennedy whose telephone number is (571) 270-1505. The examiner can normally be reached on Mon -Fri 8:30am-5pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on (571) 272-3687. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ALK

Anthony Knight
Supervisory Patent Examiner
Technology Center 2100